

REMARKS

In an Office Action dated April 8, 2003, the Examiner indicated that claims 1-4, 6, 7, 10, 21-24 and 26 were rejected under 35 U.S.C. 102(b) as being anticipated by Stopperan (U.S. Patent No. 5,428,190 ("Stopperan")) or, in the alternative, under 35 U.S.C. 103(a) as obvious over Stopperan. The Examiner also indicated that claims 1-4, 6-8, 10, 21-26 were rejected under 35 U.S.C. 103(a) as being unpatentable over Klosowiak '418 et al. (U.S. Patent No. 5,276,418 ("Klosowiak '418")), in view of Stopperan optionally further taken with either one of Li et al. (U.S. Patent No. 5,998,738 ("Li")) or Klosowiak '362 et al. (U.S. Patent No. 5,434,362 ("Klosowiak '362")). The Examiner further indicated that dependent claims 4, 6, 23, and 24 were rejected under 35 U.S.C. 103(a) as being unpatentable over the references further taken with "Chipbonding Adhesive" or "Dual Cure System Adhesives". The dependent claims 5, 6, 21 were rejected under 35 U.S.C. 103(a) as being unpatentable over the references further taken with Griffith (U.S. Patent No. 4,226,659 ("Griffith")).

Claim Rejections – 35 U.S.C. 102(b)

The last Office Action indicated that claims 1-4, 6, 7, 10, 21-24 and 26 were rejected under 35 U.S.C. 102(b) as being anticipated by Stopperan. The Applicants request that independent claims 1 and 21 be amended as shown above. The Applicants further request that dependent claims 2, 7, and 22 be amended and that dependent claims 6, 8, 9, 24, and 25 be cancelled. Claims 11, 12, 27, and 28 have been previously withdrawn from initial consideration as being claims drawn to a non-elected species. Reconsideration of the rejections is respectfully requested in light of the following remarks.

Each of the independent claims (claims 1, 21) have been amended to incorporate the features of claims 6, 9 and 10 (for claim 1) and claim 24 and 25 (for claim 21). In short, amended claim 1 is directed to a method for securing a printed circuit board to an aluminum rigidizer that serves as a heat sink. This method includes the steps of: applying a liquid adhesive to the aluminum rigidizer; applying a first cure to the liquid adhesive after application of the liquid adhesive to produce a liquid adhesive that is at least partially cured, wherein the first cure of the liquid adhesive produces a tacky adhesive that spreads, at most, a negligible amount when the printed circuit board is placed on the partially-cured liquid adhesive; placing the printed circuit board on the at least partially cured liquid adhesive; applying a second cure to the at least partially cured liquid adhesive to produce a printed

circuit board that is secured to the aluminum rigidizer; and bending the printed circuit board and the aluminum rigidizer after the second cure of the at least partially cured liquid adhesive.

Amended independent claim 21 is directed to a method for securing a printed circuit board to an aluminum rigidizer where the aluminum rigidizer also serves as a heat sink. Here, the method includes the steps of: applying a liquid adhesive to a top surface of the aluminum rigidizer; curing the liquid adhesive during a first curing stage, after application of the liquid adhesive, to produce a partially cured liquid adhesive that spreads, at most, a negligible amount when the printed circuit board is placed on the partially-cured liquid adhesive; placing the printed circuit board on the partially cured liquid adhesive; curing the partially cured liquid adhesive during a second curing stage to produce a fully cured liquid adhesive; and bending the printed circuit board and the aluminum rigidizer after the second cure of the liquid adhesive.

Stopperan describes a multilayer circuit board where ends of a jumper (75) are attached to ends of two rigid circuit boards (70, 80). An electrical connection is needed between the two rigid circuit boards. A conductive adhesive is screened on both boards and the adhesive is heated. [Col. 14, lines 32-34] The jumpers are aligned with the boards. The assembly with the conductive adhesive is described in Stopperan as being an "uncured" assembly. [Col. 14, lines 52-56] The uncured assembly is then subjected to heat and pressure. [Col. 14, lines 52-56] Stopperan is directed to attaching jumpers between two rigid circuit boards to provide electrical conductivity.

The present invention is different and deals with a completely different design and architecture. The Applicants' application describes that engine mounted electronic units are subjected to a high level of heat that can limit or impair performance. To reduce the level of heat a circuit board needs to be attached to a cooling plate. The present invention relates to an embodiment of a single flexible circuit board that is attached to a housing or rigidizer that provides both mechanical support and heat dissipation. [Application, Page 4, line 24 – Page 5, line 7] The method of assembling this design with the specific type of adhesive is described in the application. [See, e.g., Application, Page 3, line 4 – Page 8, line 17] This assembly technique is different from the design in Stopperan. For instance, Stopperan does not apply a liquid adhesive to an aluminum rigidizer. Stopperan also does not apply a liquid adhesive to any surface that serves as a heat sink. In fact, applying the conductive adhesive in Stopperan to a metal heat sink would short the components on the circuit board to the heat sink. Stopperan further does not teach a first cure of the

liquid adhesive that would produce a tacky adhesive that spreads, at most, a negligible amount when the printed circuit board is placed on the partially-cured liquid adhesive. Stopperan also does not teach bending the printed circuit board and the aluminum rigidizer after the second cure of the liquid adhesive.

Pending claims 2, 3, 7, and 10 depend from claim 1 as well as previously withdrawn claims 11 and 12 drawn to a non-elected species. Pending claims 22, 23, and 26 depend from claim 21 as well as previously withdrawn claims 27 and 28 drawn to a non-elected species. The dependent claims are believed to be allowable for at least the same reasons discussed above. Accordingly, the Applicants respectfully request withdrawal of the rejections based on this reference.

Claim Rejections – 35 U.S.C. 103(a)

The Examiner also indicated that claims 1-4, 6-8, 10, 21-26 were rejected under 35 U.S.C. 103(a) as being unpatentable over Klosowiak '418, in view of Stopperan optionally further taken with either one of Li et al. or Klosowiak '362 et al. Reconsideration of the rejections is respectfully requested in light of the following remarks.

Klosowiak '418 describes an assembly having a flexible substrate or circuit board (11) that is bonded to rigidizer plates (23, 24, 25). [Col. 4, lines 14-21] The rigidizer plates are described as "thermally conductive metal plates" that are bonded to the bottom side of the flexible substrate (11). The Office Action acknowledges that Klosowiak '418 is silent on the type of adhesive. The reference is also silent on the assembly technique with relation to different types of adhesives such as the one described in the Applicants' application.

The Office Action, however, states that it would have been obvious at the time the invention was made to join the flexible circuit and rigidizer of Klosowiak '418 with the adhesive taught by Stopperan. The Applicants' respectfully disagrees. Stopperan teaches that its adhesive is a conductive adhesive. [Col. 14, lines 20-26] The conductive adhesive is necessary because the system is attaching a conductive jumper (75) to conductive members on the circuit board (70, 80). The design in Klosowiak would not work with the adhesive in Stopperan because the flexible substrate or circuit board (11) would short to the metal rigidizer plates (23, 24, 25) in Klosowiak '418. Moreover, there is no suggestion in these references that someone would take an adhesive used to attach a conductive jumper between two rigid circuit boards and use this in the design of the

present invention of having a single flexible circuit board attach to aluminum rigidizer. And, as pointed out above, the reference would actually suggest against it since the adhesive in Stopperan is described as requiring a conductive adhesive.

Li does not make up for the deficiencies in Stopperan. Li describes a first and second adhesive film (31, 32) but does not describe a method that includes applying a first cure to a liquid adhesive, placing the printed circuit board on the partially cured liquid adhesive, and applying a second cure to the partially cured liquid adhesive, and then bending the assembly. [Col. 2, line 64 – Col. 3, line 12]

Klosowiak '362 also does not make up for the deficiencies in Stopperan. Klosowiak '362 mentions an adhesive layer (23) but does not describe a method that includes applying a first cure to a liquid adhesive, placing the printed circuit board on the partially cured liquid adhesive, and applying a second cure to the partially cured liquid adhesive, and then bending the assembly. [Col. 2, lines 53-58]

Pending claims 2, 3, 7, and 10 depend from claim 1 as well as previously withdrawn claims 11 and 12 drawn to a non-elected species. Pending claims 22, 23, and 26 depend from claim 21 as well as previously withdrawn claims 27 and 28 drawn to a non-elected species. These dependent claims are believed to be allowable for at least the same reasons discussed above. *See In re Fine*, 837 F.2d 1071, 1076, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988) (If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious.).

For dependent claims 4, 6, 23, 24, the last Office Action makes reference to "Chipbonding Adhesive" and "Dual Cure System Adhesive". The Applicants note that claims 6 and 24 have been incorporated into claim 1 and 21. These prior claims are directed to a first cure that produces a tacky adhesive that spreads, at most, a negligible amount when the printed circuit board is placed on the partially-cured liquid adhesive. The pending claims are distinguishable, in addition to the above stated reasons, because the cited references direct a reader to attaching components to a circuit board. Additionally, these references do not teach spreading the adhesive a negligible amount during a specific curing step in the fashion and way described in the present invention and in former claims 6 and 24.

For claims 5, 6 and 21, the last Office Action makes reference to Griffith. Griffith does not make up for the deficiencies in Stopperan. Griffith describes an epoxy resin but does not describe a method that includes applying a first cure to a liquid adhesive, placing the printed circuit board on the partially cured liquid adhesive, and applying a second cure to the partially cured liquid adhesive, and then bending the assembly. [Col. 2, lines 3-68]

Accordingly, for the reasons set forth above, the Applicants respectfully request withdrawal of the rejections based on the cited references.

Conclusion

As the applicants believe that the amendments overcome all substantive rejections given by the Examiner and have complied with all requests properly presented by the Examiner, the applicants contend that this Response, with the above discussion, overcomes the Examiner's rejections of the pending claims. Therefore, the applicants respectfully solicit allowance of the application. If the Examiner is of the opinion that any issues regarding the status of the claims remain after this response, the Examiner is invited to contact the undersigned representative to expedite resolution of the matter. Furthermore, please charge any additional fees (including extension of time fees), if any are due, or credit overpayment to Deposit Account No. 50-2117.

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